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Elements of orbit :—

$$
\begin{aligned}
T &= 1882,\ \text{June } 10{\cdot}58295,\ \text{G.M.T.}\\
\pi &= 53^\circ\ 53'\ 48''{\cdot}2 \\
\Omega &= 205\ \ \ 2\ \ \ 0{\cdot}8 \\
i &= 73\ \ 52\ \ 54{\cdot}6 \\
\log q &= 8{\cdot}788203. \quad \text{Motion direct.}
\end{aligned}
\quad \left.\begin{matrix} \\ \\ \end{matrix}\right\}\text{Mean Equinox } 1882{\cdot}0.
$$

Comparison with middle place (C—O) :—

$$\Delta L \cos l = 3''{\cdot}4 \qquad \Delta l = -0''{\cdot}3.$$

Heliocentric equatoreal coordinates, referred to apparent equinox and obliquity, April 1 :—

$$
\begin{aligned}
x &= [9{\cdot}9607526]\ r \sin(126^\circ\ 15'\ 11''{\cdot}2 + v)\\
y &= [9{\cdot}8607709]\ r \sin(\ 61\ \ 12\ \ 38{\cdot}4 + v)\\
z &= [9{\cdot}9026397]\ r \sin(196\ \ 41\ \ 38{\cdot}6 + v).
\end{aligned}
$$

where r = radius vector, and v = true anomaly of the comet.

Satisfactory comparisons with the star numbered 6093 in the Radcliffe Catalogue for 1845 were obtained on May 10. These give for the correction of the Ephemeris deduced from the above elements

$$\Delta\alpha \,.\, \cos\delta = +4^{s}{\cdot}36\,; \qquad \Delta\delta = -1''{\cdot}2.$$

Cambridge Observatory:
1882, *May* 11.

An Examination of the Roorkee Observations of the Transit of Venus, 1874, *December* 8. By Col. J. F. Tennant, R.E., F.R.S.

It was proposed by Sir George Airy that the observations of this transit should be reduced, so that the results of observations should be shown in the form of equations of condition, their further discussion being left to be taken up by some person in whom there should be general confidence after the whole had been so reduced. In accordance with these views I was instructed by the Government of India to reduce my observations in this manner, and the results of these were published in 1877 in a Report which has, I believe, been largely distributed through the Royal Observatory.

Since that time a Parliamentary Paper was issued in which the contact observations made by the observers whose expenses were defrayed from the Parliamentary Grants were compared and a value of the solar parallax deduced. Colonel Tupman then, in a Paper published in the *Monthly Notices*, vol. xxxviii., discussed these, with the addition of a number of observations by British observers, among which were those I had made at

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Roorkee. As a result, he ascribed a considerable error to my observed Contact at Ingress, which he considered was late observed, and rejected it in his deduction of parallax, on which, indeed, it would have produced little effect. Disagreeing in his conclusion, I recently wrote to him, pointing out that the observation did not stand alone, and that the micrometer observations confirmed its accuracy. Colonel Tupman admits this, but I think that an examination of my results may be interesting to the Society, especially as I saw what I believed to be geometric contacts free from all halo, black drop, or other peculiarity. I am aware of no details of other micrometer observations than my own, and I much regret that they have not been reduced and published, as the discussion of them would, I feel sure, have led to confidence in them.

Comparison of Cusp Distances with Observed Contacts.

At page 40 of my Report the following values are given of the time of contact as deduced from the cusp measures, the third being corrected by half a minute:—

$$\begin{array}{lll}
\text{h}\ \ \text{m}\ \ \ \ \text{s} & & \\
12\ 42\ 44{\cdot}6 - 22{\cdot}461\,\Delta\sigma & + 0{\cdot}011\,\Delta S \\
\quad\quad\ \ 42{\cdot}0 - 14{\cdot}215 & + 0{\cdot}009 \\
\quad\quad\ \ 40{\cdot}0 - \ \ 9{\cdot}738 & + 0{\cdot}006 \\
\quad\quad\ \ 39{\cdot}3 - \ \ 3{\cdot}643 & + 0{\cdot}003
\end{array}$$

It will not much matter what value is assigned to ΔS, the correction to the solar semi-diameter. I will assume it as $-1''{\cdot}85$, as found at Greenwich, and then I find the most probable value of $\Delta\sigma$ is $0''{\cdot}29$, and of the time of contact, T, it is $12^{h}\ 42^{m}\ 37^{s}{\cdot}7$. The several observations give $38^{s}{\cdot}2$, $37^{s}{\cdot}7$, $37^{s}{\cdot}1$, $38^{s}{\cdot}1$, as the values of the seconds for contact. I have weighted the observations equally in this deduction, and it is evident that it cannot matter how the weights are assigned to the equations in determining $\Delta\sigma$. If the above value of $\Delta\sigma$ be substituted in the weighted mean value of the time at page 41, the result will be $38^{s}{\cdot}1$ for the time of contact.

It is evident that the values of the contact time from the cusp measures at Egress (p. 42) will not admit of this treatment. They are

$$T_2 = \left\{\begin{array}{ll}
\overset{\text{h}}{16}\ \overset{\text{m}}{28}\ \overset{\text{s}}{28{\cdot}7} + \ \ 9{\cdot}561\,\Delta\sigma & - 0{\cdot}006\,\Delta S \\
\quad\quad\ \ 34{\cdot}9 + 12{\cdot}722 & - 0{\cdot}008 \\
\quad\quad\ \ 26{\cdot}8 + 18{\cdot}573 & - 0{\cdot}008
\end{array}\right.$$

If, however, we substitute the values of ΔS and $\Delta\sigma$ first used in them, we have for the seconds of contact the three values $31^{s}{\cdot}6$, $38^{s}{\cdot}7$, $32^{s}{\cdot}3$, whose arithmetical mean is $34{\cdot}1$. With these assumptions regarding the diameters the weighted mean equation (p. 43) gives for contact $16^{h}\ 28^{m}\ 34^{s}{\cdot}0$.

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The observed contact at Ingress was at $12^h\ 42^m\ 30^s$, and at Egress at $16^h\ 28^m\ 40^s$, the former being eight seconds earlier, while the latter is six seconds later, than the values from cusps. These intervals are such as would be due to a larger semidiameter of the Sun for visible contacts than for those deduced from the cusps of about a quarter of a second of space.

Comparison of Observed Contacts with Measures of the Distance of the Planet from the Limb.

In making these comparisons it is necessary to know the error of the tabular places of the planet and Sun relatively to each other, and also that of the assumed parallax. I assume here that the mean solar parallax is $8''.73$, so that the value of $\Delta\pi$ in my equations is $0''.15$. Also the longitude of Madras having been determined by the officers of the Great Trigonometrical Survey of India, by the telegraphic method, I shall use their corrections to the assumed longitude of my Report, thus: $\Delta L = +2^s.15$.

On the last page are given the following values for the correction of the relative places of the Sun and *Venus*, in which I introduce the above values—

$$\begin{array}{llllll} \Delta\,\text{A.R.} & = +6''.502 & -0.071\,\Delta L & -0.989\,.\,\Delta\Pi & = & +6''.50, \\ \Delta\,\text{N.P.D.} & = -2.247 & -0.017 & -2.629 & = & -1.89. \end{array}$$

These have been deduced from Colonel Campbell's observations with an Altazimuth. I also learn from Colonel Tupman that a discussion of the measures of the American photographs has given the following values:—

$$\Delta\,\text{R.A.} = +4''.83\,;\ \text{and}\ \Delta\,\text{N.P.D.} = -2''.89.$$

From the equations of condition in my Report, I get, after substituting the values of Δ L and $\Delta\Pi$,

$$\text{At Ingress}\left\{\begin{array}{lll} \text{From contact} & \Delta S - \Delta\sigma & = -7''.56 + 0.6418\,\Delta\,\text{A.R.} \\ & & \qquad -0.7183\,\Delta\,\text{N.P.D.} \\ \quad ,,\ \ \text{measures} & \Delta S - 0.833\Delta\sigma & = -6.41 + 0.5865\,\Delta\,\text{A.R.} \\ & & \qquad -0.7710\,\Delta\,\text{N.P.D.} \end{array}\right.$$

$$\text{At Egress}\left\{\begin{array}{lll} \quad ,,\ \ \text{measures} & \Delta S - \Delta\sigma & = -2.70 - 0.1744\,\Delta\,\text{A.R.} \\ & & \qquad -0.9817\,\Delta\,\text{N.P.D.} \\ \quad ,,\ \ \text{contact} & \Delta S - \Delta\sigma & = -2.81 - 0.2557\,\Delta\,\text{A.R.} \\ & & \qquad -0.9610\,\Delta\,\text{N.P.D.} \end{array}\right.$$

Confining our attention at present to the contact equations, I substituted first the Roorkee corrections to the tables and then the American, calling the results R and A. Thus

		R.	A.
At Ingress	$\Delta S - \Delta\sigma =$	$-2''.03$	$-2''.37$,
Egress		-2.65	-1.26.